Alg. 2 Warm Up # 5-3

Evaluate the logarithms:

1. $\log_2 8$
2. $\log_2 \frac{1}{4}$
3. $\log_{1/2} \frac{1}{4}$
4. $\log_{1/2} 8$
5. $\log_3 \frac{1}{9}$
6. $\log_3 1$

Review & Preview

6-113. Solve each of the following equations to the nearest 0.001.

a. $(5.825)^{(x-3)} = 120$

b. $18(1.2)^{(2x-1)} = 900$

$\log(5.825)^{(x-3)} = \log 120$

$\frac{(x-3)\cancel{(\log 5.825)}}{\cancel{(\log 5.825)}} = \frac{\log 120}{\log 5.825}$

$x - \cancel{3} = \frac{\log 120}{\log 5.825} + 3$

$+3$

$x \approx 5.717$

6-114. Simplify each expression below. If you are stuck, the ideas in problem 6-74 should be helpful.

a. $\dfrac{x}{1-\frac{1}{x}}$

b. $\dfrac{\frac{1}{a}+\frac{1}{b}}{\frac{1}{b}-a}$

$$= \frac{\frac{x}{1}}{\frac{x}{x}-\frac{1}{x}}$$

$$\frac{\frac{x}{1}}{\frac{x-1}{x}}$$

$$\frac{x}{1}\cdot\frac{x}{x-1}$$

$$\boxed{\frac{x^2}{x-1}}$$

$$\frac{\frac{b}{b}\cdot\frac{1}{a}+\frac{1}{b}\cdot\frac{a}{a}}{\frac{1}{b}-\frac{a}{1}\cdot\frac{b}{b}}$$

$$\frac{\frac{b+a}{ab}}{\frac{1-ab}{b}}$$

$$\frac{(b+a)}{a\cancel{b}}\cdot\frac{\cancel{b}}{(1-ab)}$$

$$\boxed{\frac{(a+b)}{a(1-ab)}}$$

6-115. Use the definition of a logarithm to change $\log_2 7$ into a logarithmic expression of base 5.

$$\log_2 7 = \log_5(?)$$

$$\log_2 7 = x$$

$$2^x = 7$$

$$\log_5 2^x = \log_5 7$$

$$\frac{x\cancel{\log_5 2}}{\cancel{\log_5 2}} = \frac{\log_5 7}{\log_5 2}$$

$$\boxed{\log_2 7 = \frac{\log_5 7}{\log_5 2}}$$

It would be more useful to change it to base 10!

$$\log_2 7 = \frac{\log_{10} 7}{\log_{10} 2}$$

$$\log_2 7 \approx 2.8$$

6-119. Use the ideas developed in problem 6-118 to change each of the following quadratic equations into graphing form. Identify the vertex and the line of symmetry for each one.

a. $f(x) = 4x^2 - 12x + 6$

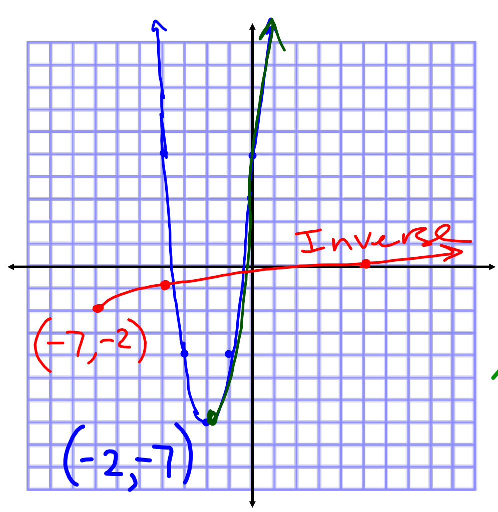
b. $g(x) = 2x^2 + 14x + 4$

6-120. Consider the function $y = 3(x+2)^2 - 7$ as you complete parts (a) through (c) below.

a. How could you restrict the domain to show "half" of the graph?

b. Find the equation for the inverse function for your "half" graph.

c. What are the domain and range for the inverse function?



a) $x \geq -2$ or $x \leq -2$

b) for $x \geq -2$

$x = 3(y+2)^2 - 7$

$x + 7 = 3(y+2)^2$

$\cancel{\pm}\sqrt{\frac{x+7}{3}} = \sqrt{(y+2)^2}$

$y = \sqrt{\frac{x+7}{3}} - 2$

Yesterday's CP's

6-109. Use the properties of logs to write each of the following expressions as a sing logarithm, if possible.

a. $\log_{1/2}(4)+\log_{1/2}(2)-\log_{1/2}(5)$

b. $\log_2(M)+\log_3(N)$

c. $\log(k)+x\log(m)$

d. $\frac{1}{2}\log_5 x+2\log_5(x+1)$

e. $\log(4)-\log(3)+\log(\pi)+3\log(r)$

f. $\log(6)+23$

a) $\log_{\frac{1}{2}}(2\cdot4)-\log_{\frac{1}{2}}5$

$\log_{\frac{1}{2}}\left(\frac{8}{5}\right)$

$\log_5 x^{1/2}+\log_5(x+1)^2$

$\log_5\left(\sqrt{x}(x+1)^2\right)$

c) $\log k+\log m^x$

$\log(km^x)$

e) $\log(4)+\log(\pi)+\log r^3-\log(3)$

$\log(4\pi r^3)-\log(3)$

$\log\left(\frac{4\pi r^3}{3}\right)$

6-110. What values must x have so that $\log(x)$ has a negative value? Justify your answer.

Look back at your warm up from today!

6-111. The fact that for any base m (when $m > 0$), $\log_m a + \log_m b = \log_m ab$ is called the **Product Property of Logarithms**. To prove that this property is true, follow the directions below.

a. Since logarithms are the inverses of exponential functions, each of their properties can be derived from a similar property of exponents. Here, you are trying to prove that "logs turn products into sums." First, recall similar properties of exponents. If $a = m^x$ and $b = m^y$, write $a \cdot b$ as a power of m.

b. Rewrite $a = m^x$, $b = m^y$, and your answer to part (a) in logarithmic form.

c. In the third equation you wrote for part (b), substitute for x and y to obtain a log equation of base m that involves only the variables a and b.

d. The property $\log_m a - \log_m b = \log_m \frac{a}{b}$ is called the **Quotient Property of Logarithms**. Use $a = m^x$ and $b = m^y$ to express $\frac{a}{b}$ as a power of m. Then use a similar process to rewrite each into log form and prove the Quotient Property of Logs.

a) Given: $a = m^x$ $b = m^y$

$ab = m^x \cdot m^y$

$ab = m^{x+y}$

b) $a = m^x$ $b = m^y$ $ab = m^{x+y}$

$\log_m a = x$ $\log_m b = y$ $\log_m (ab) = x+y$

c) $\log_m (ab) = \log_m a + \log_m b$

Review of Log Properties

A Logarithm is an exponent!

Definition: $\log_b a = x$ $b^x = a$

exponent

Power Property: $\log_b a^x = x(\log_b a)$

like: $b^a \cdot b^c = b^{a+c}$

Product Property: $\log_b a + \log_b c = \log_b (ac)$

like: $\frac{b^a}{b^c} = b^{a-c}$

Quotient Property: $\log_b a - \log_b c = \log_b \left(\frac{a}{c}\right)$

Can't have anything in front of log word.

Evaluate the log:

$\log_2 16$ $\quad\log_3 \frac{1}{27}$ $\quad\log_5 1$

4 $\quad -3$ $\quad 0$

$\log_7 7$ $\quad\log_p p$ $\quad\log_x 1$

1 $\quad 1$ $\quad 0$

Solve: (Make the base match if possible!!!)

1. $3^{x+2} = 9^{5x}$

$3^{x+2} = (3^2)^{5x}$

$3^{x+2} = 3^{10x}$

$x+2 = 10x$

$\frac{2}{9} = \frac{9x}{9}$

$\boxed{x = \frac{2}{9}}$

2. $4^x = \frac{1}{32}$

$(2^2)^x = 2^{-5}$

$2^{2x} = 2^{-5}$

$\frac{2x}{2} = -\frac{5}{2}$

$\boxed{x = -\frac{5}{2}}$

3. $2^x = 34$

$\log 2^x = \log 34$

$\frac{x(\cancel{\log 2})}{\cancel{\log 2}} = \frac{\log 34}{\log 2}$

$x \approx 5.09$

Classwork:

Blue with quiz practice

HW: 6- #138 ---> 145

Friday's Quiz:

Graphing a point and
an equation in 3 variables.

Solving a 3 variable system.